

REMARKS

Claims 20-48 are pending in this application and have not been amended in this Request. All of the claims have been rejected.

35 U.S.C. §103: Higgins

The Office has rejected claims 20, 22-24, 26-28, 32-34, 38-41, and 45-48 under 35 U.S.C. §103 over Higgins (U.S. Patent No. 6,294,405) for the reasons set forth on pages 2-10 of the Office Action. Applicant respectfully traverses this rejection.

The Office argues the device of Figure 1 of Higgins describes the invention substantially as claimed, except for limitation that the stud bump is located directly on the RDL pattern. The Office recognizes that the stud bump (20) of Higgins is instead located on an UBM pad (15). The Office argues, however, that eliminating the UBM pads 15 in the Figure 1 device would have been obvious because it has been held that omission of an element and its function in a combination where the remaining elements perform the same functions as before involves only routine skill in the art.

Applicant previously argued why such an argument fails from both a legal and a technical perspective. The Office newly argues that the UBM is not “desired or required.” The Office contends that the device of Higgins can operate without a UBM and, so, is not required. The Office, however, simultaneously recognizes that the UBM can make the pad of Higgins operate better. *See Office Action, p. 2.* But is not this last statement (that the UBM can make the pad of Higgins operate better) evidence of the desirability of the UBM? For if a component makes a device operate better, it stands to reason that such a component would be “desirable” to be included. Indeed, the inclusion of a component that makes a device operate better would seem to

be accepted wisdom in any technology, and proceeding contrary to accepted wisdom in the art is evidence of non-obviousness. *See M.P.E.P. § 2145 X(D)(III)*; *see also, In re Hedges, 783 F.2d 1038, 228 USPQ 685 (Fed. Cir. 1986)*.

Thus, the Office has not shown that Higgins teaches or suggests each and every limitation in the rejected claims. Accordingly, Applicant requests withdrawal of this ground of rejection.

35 U.S.C. §103: Higgins & Chakravorty

The Office has rejected claims 21, 25, 29-31, 35-37, and 42-44 under 35 U.S.C. §103 as being unpatentable over Higgins in view of Chakravorty (U.S. Patent No. 6,350,668) for the reasons noted on pages 2-3 and 11-18 of the Office Action. Applicant respectfully traverses this rejection.

Some of the rejected claims contain a first limitation that there exists no under bump metal under the stud bump. And other of the rejected claims recite a second limitation that the stud bump is provided on portion of the RDL pattern not covered by the insulating layer without using an under bump metal. The Office has not shown that Higgins teaches or discloses these limitations in the claims as detailed above. And the Office has not argued—much less alleged—that Chakravorty teaches or suggests these limitations. Thus, since neither reference alone teaches or suggests these limitations, it would be difficult for the Office to even argue that the combined teachings suggest these limitations.

Applicant previously argued that it would not been obvious to combine the references in the manner proposed by the Office because proposed combination would not be less compact and

illustrated that concept with a Figure.¹ In reviewing those arguments and that Figure, the Office argues that Chakravorty lists many benefits, including compactness, lower inductance, eliminates processing steps, uses fewer materials, and therefore reduces costs. The Office now contends that merely attacking one of these benefits (compactness) does not mean that it would not have been obvious to use this configuration. But Applicant previously argued that all that

would have been accomplished with this proposed modification is to increase the complexity (and cost) of the process, not too mention increasing the thickness of the combined structure by the added thickness of the solder ball (314).

See Request of September 12, 2006, p. 5. Such arguments were not addressed by the Office.

To illustrate that none of the benefits proposed by the Office would have been obtained with the proposed combination, Applicants submit the following evidence. As illustrated in the attached Figure, the Office's proposed modification does not eliminate any component of Higgins. Rather, solder balls (314) have merely been added between the semiconductor device (11) and the substrate (50) of Higgins. With such a modification, the Office's proposed benefits would not have been obtained for the following reasons.

1. *Compactness.* The reasons of record, including the attached Figure, show how the proposed combination would be thicker and less compact. The Office appears to have accepted this fact since it did not argue to the contrary.

2. *Lower Inductance.* Lower inductance would not be a necessary result for two reasons. First, too much solder (in the solder balls 314) would short the adjacent pads: not a desired result. Second, the inductance is limited by the cross section of the ball/metal stud/bondpad structure, and having a bunch of overlapping solder certainly wouldn't help the inductance.

3. *Elimination of Process Steps.* In the Office's proposed combination, no component of Higgins has been eliminated and, therefore, no process step (for making these components) could have been eliminated. Indeed, as shown in the

¹ That Figure is submitted again with this Request.

attached Figure, the Office's proposed modification would require, at the very least, one additional step of providing the solder balls (314) on the stud bump (20).

4. *Fewer Materials.* In the Office's proposed combination, no component of Higgins has been eliminated, so the same number of materials (for making these components) will still have to be used. Indeed, as shown in the attached Figure, the Office's proposed modification would require more materials (i.e., those needed for the solder balls 314).

5. *Reduced Costs.* In the Office's proposed combination, no component of Higgins has been eliminated, so no costs (resulting from these components) have been reduced. Indeed, as shown in the attached Figure, the Office's proposed modification would require more processing steps and more materials (as shown above). Thus, the costs would presumably increase.

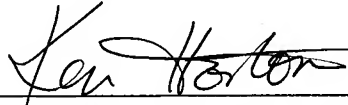
Thus, the Office has not shown that the combination of the cited references teaches or suggests each and every limitation in the rejected claims. Accordingly, Applicant requests withdrawal of this ground of rejection.

CONCLUSION

For the above reasons, as well as those of record, Applicant respectfully requests the Office to withdraw the above grounds of rejection and allow the pending claims.

If there is any fee due in connection with the filing of this Request, including a fee for any extension of time not accounted for above, please charge the fee to our Deposit Account No. 50-0843.

Respectfully Submitted,

By 
KENNETH E. HORTON
Reg. No. 39,481

Date: February 22, 2007

Exhibit A